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METHODS OF ENGRAVING.—II.

IN our last issue we gave a synopsis of the three first lectures on the "Old and New Methods of Engraving" delivered at the Drexel Institute in Philadelphia by Mr. S. R. Koehler, Curator of the Department of Prints, Museum of Fine Arts, Boston, Mass., and of the section of Graphic Arts, U. S. National Museum, Washington, D. C. In the following lectures, Mr. Koehler, after touching on the planographic or substitute processes, the learned expert launched into the various photo-mechanical processes which have now usurped the older process. The series closed with an entertaining discourse upon "Print Collections and Engraving as a Subject of Study."

Mr. S. R. Koehler, after completing this course of lectures at the Drexel Institute upon the history and the processes of engraving, was entertained at dinner Wednesday evening, March 14th, at the Art Club of Philadelphia, by a number of the club who wished to show their appreciation of his work. Among those present were Peter Moran, one of the first of American etchers, who presided; John Sartain, the vetern engraver; Edward H. Coates, president of the Academy of the Fine Arts; Dr. James MacAlister, president of the Drexel Institute; L. W. Miller, principal of the School of Industrial Art; Mr. Fenollosa, of the Boston Museum, and a dozen or more of well-known

artists and amateurs. The dinner was quite informal, but one or two brief complimentary speeches were made, to which Mr. Koehler modestly responded, and by general request gave some account of the history of the *American Art Review*, the influential publication whose noble volumes, now prized by collectors, will remain as a monument of his services in the cause of art in his adopted country.

The following synopsis of the concluding lectures of the course, will form instructive reading for all who are interested in photography and illustrating:

FIFTH LECTURE OF THE COURSE.

Mr. S. R. Koehler, on Monday evening Feb. 27th, delivered the fifth lecture of his course on "Old and Modern Methods of Engraving" in the auditorium of the Drexel Institute, Philadelphia. His subject was "Planographic Processes — Substitute Processes."

The lecture treated in the first part of the planographic processes, which derive their name from the fact that the printing is done from a plane surface, without either raised or incised lines, and of which lithography is the best known type. The second part was devoted to the substitute processes, which are the outcome of the industrial development of the nineteenth century, and the aim of which is to substitute something cheaper for something better and more expensive, solely with a view to profit.

The lecturer said that toward the end of the eighteenth century there lived in Europe two young poets—William Blake, in London, and Aloys Senefelder, in Munich, both so poor that they could not afford to have their poetry printed, and who, therefore, tried to invent means to enable them to do their own printing. Blake, by the aid, as he conceived, of visions of the night, discovered the relief-etching process, which he applied to the printing of his mystical poetry. Senefelder, an actor's son and dramatic poet, also experimented with relief etching, but later, in the course of experiments conducted with as much science as he had knowledge of, he invented lithography and abandoned poetry altogether. His invention has been attributed to a lucky acci-

dent, "but we must take care," said the lecturer, "how we speak of such matters. Accidents happen every day, and we might all of us possibly be great inventors and perhaps millionaires if we had the faculty of understanding these accidents."

A detailed account was then given of lithography, which is really a chemical process—a fact which explains the apparent mystery of printing from a perfectly plane surface. Several impressions were printed from a lithographic stone on a lithographic press to show that if the stone is rolled up in ink while dry it accepts the ink on the whole surface, and would, therefore, give an even, black impression, while if it is moistened and then rolled up, only the design upon the stone accepts the ink, while its bare parts reject it, thus showing that the surface of the stone after it has undergone the various manipulations previously described by the lecturer, consists of two different materials—the one having more affinity for water than for ink, the other more for ink than for water.

After a brief reference to other planographic processes, such as zincography, and to the possibility of aluminum soon playing an important part in these processes, Mr. Koehler proceeded to give some illustrations of the history of lithography by means of stereopticon views. He said that lithography was interesting and valuable not only for the interpretative work it had done, but also from the fact that especially during its earlier days a number of great artists, particularly in France, such as the Vernets, Gericault, Delacroix and others, had done original work by its means, and, owing to its cheapness, it had soon become the recorder of passing events, as well as the favorite medium of expression of the caricaturists. For this reason a collection of lithographs covering the period from the thirties down to the sixties of this century furnishes an illustrated chronicle of the time such as does not exist for any other past period. Here again the French took the lead, for men like Charlet, Raffet, Gavarni and Daumier were not only popular lithographers and caricaturists, they were at the same time poets and artists.

The remainder of the lecture was devoted to a short account of the many substitute processes.

During his lecture Mr. Koehler was assisted in his explanations by a press provided by the Ketterlinus printing house.

SIXTH LECTURE OF THE COURSE.

In the auditorium of the Drexel Institute, on Thursday evening March 1st, Mr. S. R. Koehler delivered the sixth of his entertaining course of lectures on "Old and Modern Methods of Engraving."

This lecture was the first of three on "Photo-Mechanical Processes," which are so called because the printing forms which they yield are made by the help of photography, while the impressions from these forms are taken in presses which are mechanical contrivances. While the old hand-processes were the outcome of the artistic aspirations of mankind, and while the substitute processes were the result of the industrial development of the nineteenth century, the photo-mechanical processes were born of the modern scientific spirit. This remains true in spite of the fact that these processes have long since fallen into the hands of industrialism, and that, in the industrial war which is being waged throughout the so-called civilized world, they have succeeded in killing off most of the substitute processes.

The reasons which prompted the scientific spirit to seek a new means of producing printable pictures grew out of the undeniable fact that all human work is unreliable. What was wanted was some process in which all the work should be done by nature, in accordance with her inexorable law. It was thought that such a process had been found in photography. Two errors must, however, be noticed here. The first is that photography is supposed to be reliable; the second that the photo-mechanical processes are assumed to be the outcome of photography. On the contrary, photography is quite unreliable, which assertion was supported by some illustrations, and photography is the outcome of the photo-mechanical processes.

Joseph Nicephore Niepce began his experiments in search of printing forms produced by light in the year 1813, while Daguerre, who, at a later period, was associated with Niepce, did not announce his discovery of the daguerreotype to the French Academy until 1839.

From the fact that photography is unreliable it follows that the photo-mechanical processes must also be unreliable, and it was shown that to the shortcomings of photography they even added others of their own. The problem would not be solved until a sort of "drop-a-nickel-in-the-slot" process had been invented, which, however, was not ever likely to be the case. Nevertheless, it must be conceded that these processes are marvelous in their results, representing a considerable step in advance within certain limits, and that we may still look for further developments in the same direction.

The lecturer then gave some idea of the classification of these processes, and proceeded to exhibit the various materials used as agents for the displacement of artist and engraver in the processes generally in use at present. These are asphaltum, albumen, gelatine, bichromate of potassium, of ammonium, and finally light.

The action of the light upon these substances was illustrated by some experiments, and the application of the results attained in this way in the simpler of the photo-mechanical processes, that is, those which are used for the reproduction of drawings in absolutely black lines and dots, was then shown.

The lecturer closed with some remarks on the necessity of training young artists as special draughtsmen for these processes.

SEVENTH LECTURE OF THE COURSE.

On the evening of Monday, March 5th, Mr. S. R. Koehler delivered the seventh lecture of his course on "Old and Modern Methods of Engraving." His subject was "The Photo-Mechanical Half-tone Relief Processes and Intaglio Processes."

At the last lecture the processes for the reproduction of originals in black lines and dots were examined. The first half of this lecture was devoted to those processes which work from half-tone originals, that is to say, washed drawings, water-colors, oil paintings and photographs from nature. To show that this can be done a photograph from a painting by Couture was thrown upon the screen, together with a photograph from the half-tone reproduction, made from the same original.

As the relief-printing processes cannot work with structureless grays, it follows that these half-tone processes must break up the masses of the original into lines or dots. Now, asked the lecturer, how can this be done without the use of graving tools of any kind guided by the human hand and human intelligence? "The process is simple enough, at least apparently," said the lecturer, and then he proceeded to describe in detail the various stages of the half-tone relief process as it is at present practiced, at the same time warning the audience that he could not enter upon the consideration of the earlier forms of these processes, such as the meisenbach, etc.

Mr. Koehler then explained the use made of the screen or grating in these processes for the purpose of breaking up the structureless masses.

The worst feature of these processes, he said, was the uniformity of texture, which is the necessary result of the screen. He took issue, therefore, with those artists who maintain that the processes are more desirable for the reproduction of painting than wood engraving. He claimed for the latter that certainly so far as the best of it is concerned it was far better fitted to reproduce values and textures, and, therefore, tone and color, than the half-tone processes. The bad effect of these processes upon the character of our periodicals was made evident by showing an old number of a weekly periodical illustrated with wood engravings, and a late one illustrated by half-tone work.

After a short allusion to the old Ives process and to the grain half-tone processes, the subject of photo-intaglio, or photogravure, was taken up. Again, only one process was selected for elucidation—namely, the photo-aquatint process, that being the one now most generally practiced.

EIGHTH LECTURE OF THE COURSE.

On Thursday evening March 8th, Mr. S. R. Koehler gave the eighth lecture of his course on "Old and New Methods of Engraving." His subject was, "The Photo-Mechanical Processes — Collographic Processes, Photo-Lithography, the Woodburytype."

The photo-mechanical processes treated of in the two preceding lectures — the relief and the intaglio — produced printing forms which differ in nothing essentially in their technical features from the plates and blocks resulting from the old hand processes. The printing forms produced by photo-lithography are also technically considered the same as those produced by ordinary lithography.

It is quite different with the collographic processes and the Woodburytype, of which it may be said that not only the printing forms and the treatment they require are novel, but also the results yielded by them. These results come as near as possible to the requirements involved in the term "a printed photograph." Of the Woodburytype, furthermore, it may be said that it has the unique distinction of being that seeming impossibility— a picture produced in a press and yet offering structureless grays.

The collographic processes, from *kolla*, glue, and *graphein*, to grave, are so called because the printing form is a film of gelatine, which is glue, on a support of some kind. A film of bichromated gelatine is spread upon a glass plate, or, sometimes, a copper plate, and dried in the dark under certain conditions of temperature and atmosphere. It is then exposed under a negative.

When a film so treated is moistened and then rolled up in printing ink, it accepts the ink on the exposed parts in exact proportion to the action of the light upon it. In other words those parts of it which receive the maximum exposure accept also the maximum of ink, and thus produce the darkest shades in the impression, while the parts which were protected absolutely from the action of the light accept, theoretically at least, no ink at all, and the various shades of gray take the ink in varying proportions, in accordance with the different degrees of exposure. The versatility of this process was illustrated by a number of lantern slides, and the printing itself, from a glue film, was demonstrated on a press secured for the occasion from the Gutekunst Company.

The lecture next explained the photo-planographic processes, more especially photo-lithography, both in lines and half-tone. The line process selected for illustration was that known as the

Osborne process. There are two kinds of photo-lithographic processes, transfer and direct. The Osborne is a transfer process; that is the image is first produced on paper coated with bichromated gelatine, then rolled up in ink, developed, and finally transferred to stone, precisely the same as in the ordinary lithographic transfer processes. Of the half-tone lithographic processes two were discussed, the gelatine grain transfer and the asphaltum. The latter produces the printing image directly on the stone.

The last subject treated by Mr. Koehler was the Woodburytype, which, in spite of the beauty of its results, is fast dying out, owing to certain shortcomings. The first step in the process is to make a gelatine wash-out relief by the carbon printing system. This relief is then crushed into a soft metal block. The result is a shallow mould, which serves as the printing form. The printing solution is a hot solution of gelatine, charged with some pigment. This solution is poured into the mould, and against it is pressed a sheet of paper, which is allowed to rest upon it until the gelatine has cooled and set. The result is a gelatine relief on paper, but, as the gelatine is apt to chip off in the course of time, the prints are liable to destruction, especially in a country with a variable climate, such as we have in the United States.

In concluding, Mr. Koehler called attention to the necessity of schools for the purpose of teaching as well as scientifically investigating the various photo-mechanical processes. He suggested that the Drexel Institute was admirably adapted for carrying out such a plan. A few words were then given to the consideration of the possible influences exercised by the photo-mechanical processes upon the old method of engraving.

Mr. Koehler's closing lecture on Monday evening will deal with print collections and engravings as a subject of study.

THE CLOSING LECTURE OF THE COURSE.

On the evening of Monday, March 12th, Mr. S. R. Koehler delivered the last of his course of lectures on "Old and Modern Methods of Engraving." His subject was "Print Collections—Engraving as a Subject of Study." Previous to the commencement of the lecture Dr. James MacAlister, President of the

Institute, on behalf of the Board of Managers, returned thanks to Dr. Koehler for his highly instructive and entertaining course of illustrated lectures.

"The pursuit of the history of engraving," said the lecturer, "and, still more, the collecting of engravings, is looked upon by the public at large as not much better than a waste of time, and the collector himself is considered a 'crank.' The method sometimes followed in collecting offers some excuse for these opinions, but it is not right to judge the whole subject by the follies which are merely the excrescences of collectorship.

"The true aim of print collections, especially of public collections of this kind, is but little understood as yet. It is a mistaken idea that they are intended solely for æsthetic enjoyment. They may owe their origin to this cause, but it is very far from being true that it is their sole excuse for being. A print collection is a vast storehouse of information—a pictorial library, as it were, to which everyone may turn now and then, not only with pleasure, but profit."

By a series of examples it was then shown how prints may be utilized as authentic documents illustrating the spirit of the time which brought them forth. Among the illustrations were a New Year's card and a relief wall map, both of the fifteenth century, emphasizing in a manner the old saying that "there is nothing new under the sun."

As a special subject worthy of forming part of any public print collection, art industrial designs were pointed out, and it was stated that there are a number of such collections in Europe, but not one in the United States. Mr. Koehler suggested that a collection of this kind at the Drexel Institute would be quite in keeping with the other valuable accessories of the institution.

What was said by the lecturer thus far merely pointed out the utility of prints in special cases. The second part of Mr. Koehler's talk aimed to show that engraving may be studied profitably in the interest of general culture, and at the same time that it is an integral part of the history of mankind, controlled by law quite as much as any other manifestation of human activity. It can, indeed, be shown that even such apparently trifling matters

as the kind of lines used by the engravers are part and parcel of the intellectual life of humanity, influenced by the same forces which are at work in the shaping of its more weighty concerns.

As an attempt to follow out this idea through the whole history of engraving would be too vast an undertaking for a single lecture, Mr. Koehler confined himself to elucidating it by examining the history of engraving in the late fifteenth and early sixteenth centuries in Germany, and contrasting it with the development in Italy during the same periods. It was demonstrated that, in Germany, the period in question was really one of engravers, all of the painters of the time being known either as engravers or designers for the wood-cut, while in Italy it was a period of painters only, a few of whom made isolated attempts at engraving. On the other hand, the work of the engravers of Germany showed much more of the painter-like qualities of which engraving is capable than that done in Italy, which confined itself, until after it had been influenced by the Germans, to the rendering of drawings. It was shown that this result was due, on the one hand, to the general forces which were active at the time of the Rénaissance, and to the local forces which, to some extent, counteracted the general forces in the northern countries.

Mr. Koehler closed by saying that if we have once grasped the truth of the proposition laid down at the beginning, it will be possible not only to study art in general, but even in apparently so unimportant a sub-division of it as engraving, a branch worthy of dignified and serious consideration.

Exhibition Lantern Slides.—Mr. John Carbutt, Jr., has utilized a number of his fine negatives obtained during his sojourn at the late Chicago Exhibition, by making a series of lantern slides. Among the number are three subjects taken by the electric and search light, on the last night of the Exhibition, making a fitting closing to any World's Fair lecture.

SOLIO PRINTS BY DEVELOPMENT.

EVER since the invention of the dry plate a really quick printing process has been looked forward to as the next step in photographic process. Much was gained over the old albumen process when the gelatino-chloride papers were introduced, but the photographer continued to be at the mercy of the weather clerk, and "dark days" are still held responsible for broken promises and the consequent bad temper of disappointed customers. But the problem is solved in "Solio" prints by development.

The formula which we present is not a mere rudimentary experiment but has been proven a practical, working success, giving prints equal, if not superior to those made by the printing-out process. By this method prints can be made in from one-tenth to one twentieth of the time required for printing-out, while the whole process is so simple that any photographer can readily learn it. It is only necessary to print until a fairly strong outline shows, and from this point every bit of detail that was in the original negative can be developed up. The developer does the work of the sun, but, unlike the sun, is under the control of the operator.

Great latitude can be allowed in the picture, thus permitting the use of cheap help in the printing room provided there is a good operator at the developing tray. In fact an entire set of printing frames may be taken in at once without looking at each particular print, any inequalities in printing being easily remedied in the development. It is as easy to tell when to stop the developing as it is to tell when to stop printing by the ordinary method.

The advantages of the process to the professional photographer, especially during dark weather or during the holiday season, are obvious. He is practically independent of the sun, and on the darkest, cloudiest days it is an easy matter to print deep enough in an hour or two so that the prints can readily be developed to the proper point for toning, while with good sunlight prints can be made ready for the developer in from one to five minutes, varying of course according to the density of the negatives.

The amateur photographer who usually has but little time during the day to ride his favorite hobby will welcome a process that enables him to start a number of prints in a few minutes time and then finish them up at his leisure at night.

Formula for Developing Solio Paper.—Print one-tent to one-twentieth the depth required for the regular toning process. The print will show faint detail in all but high lights. Immerse the dry print in the developer. Develop until the print shows all the detail and about half the strength required in a finished print; this will take ten to thirty minutes.

SOLUTION NO. 1.

Hydrochinon	⅛ ounce	(avd.)
Sulphite soda	½ "	"
Potassium bromide	1 "	"
Ammonium bromide	2 "	"
Water	64 "	(½ gal.)

SOLUTION NO. 2.

Caustic soda	¼ ounce	(avd.)
Water	16 "	(1 pint)

SOLUTION NO. 3.

Tannic acid	8 grains
Water	1 ounce

To develop 10 or 12 prints take

No. 1	5 ounces
No. 2	1 ounce
No. 3	1 dram

The print will, when first put in the developer, fade away to a pale yellow; then will slowly develop up to a point showing about as much detail and about one-half the strength as a finished print, remaining yellow, however. If the developer works too fast dilute with water.

As fast as developed throw prints into a solution of acetic acid 3 drams per gallon of water. Wash five minutes in frequent changes of running water; then tone in combined bath as usual. No extra fixing.

Hints.—A little extra care should be exercised in putting Solio intended for development into the printing frames and taking it therefrom. It should be done by subdued daylight.

If the prints continue to develop in the toning bath, too much alkali (solution No. 2) has been used in the developer. The prints will appear to strengthen by reason of the change of color in toning but they ought not to increase in detail.

The exact point to which the printing is carried does not seem to make very much difference; so long as the print is under printed, it can be brought up by the developer.

Development is best done by ordinary lamplight without a yellow shade.

Prints made by the above process are rather more brilliant than those fully printed out.

More sulphite in No. 1 tends to make softer prints.

Solution No. 3 requires a drop of carbolic acid if it is desired to keep indefinitely. The tannic acid is used only to harden the gelatine.

COMMERCIAL METALS.

Bath Metal.—An alloy of copper and tin.

Bell Metal.—Copper and zinc.

Bronze Metal.—Composed of tin and copper.

Britannia Metal.—A mixture of tin, antimony, copper and bismuth.

Cannon Metal.—An alloy of tin and copper.

Dutch Gold.—A combination of copper and zinc.

German Silver.—An alloy of copper, nickel and zinc to which a little iron and tin are added.

Gold (*Standard*).—Gold with a percentage of copper.

Gold (*Old Standard*).—Gold with a proportion of silver and copper.

Gun Metal.—Tin and copper.

Mosaic Gold.—An alloy of copper and zinc.

Pewter.—A fusion of lead and tin.

Sheet Metal.—Lead with the addition of arsenic.

Silver (*Standard*).—Silver with a percentage of copper.

Solder.—A combination of tin and lead.

Type Metal.—A fusion of lead and antimony.

White Copper.—A mixture of copper and arsenic.

NEWSPAPER ART ON EXHIBITION.

IN the rapid and persistent evolution of nineteenth century journalism the photographic art department has become an influential factor in the production of the daily paper. So significant is the position it assumes in the line of the public press that the art of newspaper picturement may be taken as a "sign of the times." On the copiousness and character of its illustrations the newspaper relies for much of its facility in finding its way to public patronage. Just what part Philadelphia plays in the field of artistic newspaper representation is admirably shown in the exhibition of over four hundred sketches in black and white by the newspaper artists of this city, which has been opened at the Pen and Pencil Club.

Newspaper cuts have given rise to jokes galore, but considering the assemblage of four hundred sketches gathered from the city offices one cannot but feel that much of the joke is founded on tradition rather than fact, and that the finest of these illustrations given out to the public with all the news of the day, are far superior in their way to the illustrations that delighted our grandparents in their high-priced books.

Looking over the sketches, hung in "Bohemia Hall," if one thought fastens itself to the mind more firmly than another, it is the versatility required from every aspirant ere he becomes affixed to the corps of the art department of the Philadelphia newspaper He must be equal to all demands. He must not simply know how to draw; he must be able to compose and to create. Here are some of the things he is expected to furnish and has furnished, to judge by what the exhibition says: This day he draws a portrait of Gladstone; to-morrow a bird's-eye view of a parade on Broad street; pretty conceits for the woman's page on all days. For Sunday he has managed fashion's latest ball, but of course this is only one of the many "extras" for Sabbath Day, and as the assemblage moves on, now a yacht race, then the last mill between Mitchell and Corbett; "They Take Their Dogs to Walk," a Chestnut street swell in his swagger overcoat and

nobby cane, a circus or theatrical advertisement, in fact, everything from an advance cut of the pretty girl's Easter bonnet to a cartoon on the silver bill. And the wonder is that he has done it all. He has told his story in a clear-headed fashion, and if sometimes he fails he may be pitied, but not condemned.

To the healthy competition among Philadelphia papers is largely to be attributed their high standing in pictorial art. Of one phase, cartoons giving the essence of the political situation, is this especially true. This epigrammatic of the day is admirably illustrated in the exhibition by the cartoons of J. Allen Schaadt, George R. Brill and R. Clyde Swayze. Portrait work is carried to a high notch by Leon A. Shafer and J. R. Skeen. Benjamin Story, Julius C. Fireman, H. Sweboda and Harry Ponitz. Imaginative work is well represented by the sketches of W. J. Glackens, F. R. Gruger, E. W. Davis, R. C. Swayze, J. L. De Mar, whose work on chalk plates is especially interesting from a technical point of view, and V. H. Bailey. One of the French Commissioners of Education who saw work of the last-named young artist at the World's Fair, made the remark that what pleased him especially was its superior educational quality. Advertising illustrations by Skeen, Shafer and Brill, original designs and ornamental work by John Sloan, Jr., Harry Wittman, James E. Laub and W. B. Griffith contribute to the kaleidoscopic review of local newspaper art.

In the ornamentation of "Bohemia Hall" the Pen and Pencil Club also proved its intelligence in matters pertaining to decorative art. The room was made festive with palms and choice plants. From the ceiling were hung sundry mischievous looking objects such as policeman's hats, base hall bats, the mitts that Mitchell met, lanterns, and, suggestive of old Egyptian customs, a skull and cross bones oscillated from another quarter of the ceiling. The relation of these articles to newspaper art is rather obscure, but it may be that they are "models" which inspire the members of the happy club in their nightly devotion at the shrine of art.

There are times when we will doubt the truth, as when a liar tells it.

REVELATIONS OF THE SPECTROSCOPE.

A RAY of star-light—one of infinite millions which left the star ten or twenty or a hundred years ago, to travel through space in all directions—reaches the earth, and by a strange chance it falls on the object-glass of a telescope. It flashes down the tube, encounters a battery of prisms, is wrenched and shattered in its passage through this labyrinth of glass, and falls finally in a fragmentary shape on the retina of an observer's eye. Let us listen to the story that he will gather from this broken ray of star-light.

1. This star is a body very similar to the sun. It is surrounded by an atmosphere in which float metallic vapors. Among these vapors are those of sodium, iron, calcium, manganese, and, perhaps, bismuth—all common terrestrial elements.

2. This star is receding from us at the rate of thirty miles a second.

3. This star is double. In the most powerful telescope it appears as a single star; but no matter. Its light, examined from night to night, behaves in such a way as to leave no doubt that there are here two suns revolving, like a pair of dumb-bells thrown into the air, about their common centre of gravity.

All this information has been obtained by merely looking at a star through a prism. It seems hardly credible; and yet it is really a very simple matter. It is simply a case of opening a cipher message and applying the key to read its contents. The prism has analyzed the star's light—has broken it up into its component parts, and the rest is simply an interpretation of the appearance or the behavior of the parts in accordance with well-known principles. The secret is this:

Light is transmitted by undulations in a "luminiferous ether," somewhat as sound is conveyed by vibrations in the air. Light-waves, like sound-waves, are of different lengths; and as, in the case of sound, the longest waves produce a low, dull sound, which rises in pitch as the wave shortens, so light-waves of different lengths produce different effects on the retina of the eye. The

longest light-waves produce in the eye—or, rather, in the brain, through the medium of the eye—the sensation of a dull, red color. As the wave shortens, the red becomes more brilliant; it passes into orange. Still shorter waves give yellow, then green, and so on, until the shortest waves that effect the eye at all give violet. When light-waves of all lengths are simultaneously received into the eye, their combined effect produces the perception of pure white.

When a beam of white light falls obliquely on the surface of a prism of glass or of some other transparent substance, and passes through the prism, it is bent out of its course—it is refracted, as opticians say; and an important fact is that its component rays, having different wave-lengths, are affected differently. The shorter the wave-length, the greater is the amount of the refraction, or bending. It follows that the beam of light issues from the prism broken up into its component rays, and if in this shape it is allowed to fall on some white surface we have a beautiful exhibition of the light "spectrum"—a band of light in which appear all the rainbow colors, beginning with red and ending with violet.

The spectroscope is, as its name implies, an instrument designed for producing and examining this spectrum. Its essential parts are, first, a narrow slit for the admission of light. (This slit is for the purpose of obtaining a pure spectrum—one in which the colors do not overlap each other, as they do when a prism is simply held in the sunlight); second, a prism, or more usually, a "battery" of several prisms, for dispersing the light and producing the spectrum; third, a small telescope for observing the spectrum, which is not allowed to fall upon a screen, as in the experiment above indicated, but is viewed directly.

This is the instrument. Its use is based upon the fact, already hinted at, that when light is thus decomposed it presents certain peculiarities, which indicate the source from which it came. When a rod of iron is heated, at a certain temperature it assumes a dull red color. It has begun to set the "ether" in motion At first it vibrates only long light-waves. As it becomes hotter it assumes a brighter red. If it is heated sufficiently it becomes dazzling white. It is now vibrating light-waves of every length,

and if in this white-hot condition it is placed in front of the slit of a spectroscope its spectrum will be found to contain, like the solar spectrum, all the colors from red to violet. There are no breaks or gaps in it, but the various colors pass into one another by imperceptible gradations. Such a spectrum is said to be "continuous." If this spectrum is watched while the iron cools, it will be found that the spectrum begins to fade at the violet end. This color disappears, then the purple, then the blue, and so on, until finally the last trace of the red is gone. An important point to be noted is that at no time does the spectrum cease to be continuous so far it extends.

If, instead of an iron rod, any other substance had been similarly heated—a rod of glass, a piece of copper, of silver, a stone —the same result would have been obtained. The spectrum would have been continuous, and would have been precisely the same in appearance in all the cases. And if, after the substance had reached a white heat, the heating had been continued beyond the melting point, the spectrum would have remained unaltered, except that it would have become brighter because of the increased intensity of the light.

The spectra of glowing solids and liquids, then, present no peculiarities by which one substance can be distinguished from another. But the case is quite otherwise with gases and vapors. When an ordinary gas, such as hydrogen, or a metal in a gaseous state (produced usually by the heat of a powerful electric spark) is rendered luminous, it gives a spectrum consisting merely of a limited number of bright lines, and these lines are different for different substances. That is, instead of setting in motion light-waves of all lengths as does a glowing solid, a glowing gas emits only rays of a few wave-lengths peculiar to itself. The lines which form the spectrum are simply so many images of the slit, produced by the different rays which have passed through it. Thus, the spectrum of sodium consists merely of a close pair of orange-yellow lines; that of hydrogen consists of three lines— a red, a green and a purple line; the spectrum of iron, the most complex of all the spectra, is made up of several fine lines of various colors. Since every substance in nature can be rendered

gaseous by the application of a sufficiently great heat, every substance is thus marked with an ineffaceable label, by means of which it can be recognized, when luminous, wherever it is found —whether it is only a few feet away in the chemist's laboratory, or is as far away as the most distant star. Light loses none of its characteristics in its passage through space.

The extreme delicacy of the spectrum test is illustrated by the fact stated by Lommel, that the three-millionth part of a milligramme of a salt of sodium, an imperceptible particle of dust to the naked eye, is yet capable of coloring the flame of a candle yellow, and of giving the yellow lines of sodium in the spectroscope. Indeed, sodium in the form of common salt (sodium chloride) is so universally present as an impalpable dust floating in the air that it is next to impossible to get a spectrum which does not show the sodium lines. Another illustration of the delicacy of spectrum analysis is the discovery by this means of four alkaline metals to which have been given the names cæsium, rubidium, thallium and indium, which had previously escaped the notice of chemists.

The spectroscope had been used in the chemist's laboratory for some years, when the discovery was made of another property of light, which at once enormously increased its power and gave it its present inestimable value as an astronomical instrument. When a gas or a metal vapor is at a temperature too low to emit light, if the light of a candle or of some other light-source which gives a continuous spectrum is made to pass through the cool gas, and is then examined with a spectroscope, there are seen crossing the spectrum of the candle-light dark lines precisely at those points where would be seen the bright lines of the gas, were it luminous. This means that the cool gas or vapor has the power of stopping or absorbing every ray of light of a wave-length peculiar to itself which seeks to pass through it, while it gives free passage to all other rays. The result is a "reversed" spectrum—a spectrum consisting of dark, instead of bright lines. The lines are all there and are of their proper intensity, so that the "label" still remains. It is just as easy, for example, to recognize sodium by means of a pair of dark lines as by a pair of

bright lines in the same position. It is a difference only of a name printed black instead of yellow.

The complete key which goes with the spectroscope, then, is this:—

1. A solid or a liquid, when heated to luminosity, gives a "continuous" spectrum.

2. A gas or a metal vaporized, when luminous, gives a "line" spectrum.

3. A non-luminous gas or metal vapor, behind which there is a light-source, gives a "reversed" spectrum — a spectrum which consists of dark lines having the same position and the same intensity as the bright lines of the luminous spectrum.

THE PHENOMENON OF ABSORPTION.

The value of this third clause in the "key," and its application in astronomical work, will be understood when it is said that the spectrum of the sun and those of the stars are crossed by dark lines — in the case of the sun these lines are reckoned by the thousand — which are found to coincide in position with the bright lines of terrestial elements. An exact coincidence, not only of position but also of intensity, has been shown by careful comparison to exist in so many and so complex cases that but one explanation is admissible, and this is the very simple explanation that the sun and stars are surrounded by the comparatively cool vapors of the substances whose reversed spectra are so perfectly presented. This discovery was made by Kirchoff, in 1859. While engaged in the work of mapping the spectra of various metals, Kirchoff placed the spectrum of iron above that of the sun, and was astonished to find a coincidence of more than sixty bright lines of the vaporized iron with the same number of dark solar lines. He proved mathematically that the chances are more than a million-million-million to one that this could not happen with out some causal connection. The phenomenon of "absorption" was discovered shortly after this, and the "new astronomy" began its wonderful career.

More than 450 bright iron lines have been identified with dark solar lines, and it has been established that 75 lines of calcium,

57 of manganese, 33 of nickel and 170 of titanium exactly correspond in grouping, breadth and degree of shade with the same number of dark lines in the solar spectrum. In all more than twenty terrestial elements, including, besides those just named, sodium, magnesium, copper, zinc, cobalt, aluminium and hydrogen, have in this way been shown to exist in the sun's atmosphere; and there is a list of ten or twelve other elements which are suspected to be there, but which are not certainly identified.

The number of terrestial elements found in the stars is much smaller than this, as could hardly be otherwise, their spectra being exceedingly faint. There are many differences in the stellar spectra; but iron, calcium, sodium, magnesium and hydrogen are found very generally in those distant suns.

Another result of the spectroscopic study of the stars has been to bring out the fact that they are of different temperatures — at different stages of world life. The white stars, of which Sirius is an illustrious example, are the hottest. Their spectra show only faint traces of metallic "absorption," but the hydrogen lines are very strong.

The yellow stars, like Arcturus, give spectra very similar to the sun's — spectra crossed by the dark metal lines. These stars, are, therefore, put into the same class as the sun, which is held to be a luminary in what might be called middle life. About eleven-twelfths of the stars fall into one or the other of these two classes.

A few stars — none of them above the fifth magnitude — are decidedly red. Their spectra show strong carbon absorption. They are held to be suns verging towards final extinction as luminaries. The more refractory of their substances apparently have ceased to exist in the form of gases, but may already have assumed a liquid state.

The rest of the stars show various peculiarities of spectra, which in some instances are thought to indicate that they are not, properly speaking, stars, but are merely condensing swarms of meteors.

One of the earliest uses to which the astronomical spectroscope was put — in 1869, by doth Dr. Huggins and Father Secchi —

was to decide the long-standing question of the existance of true nebulæ. Many of the objects which were classed as "nebulæ," when examined with this instrument, were found to give "continuous" spectra, and these objects were accordingly decided to be star-clusters. The light which gave such a spectrum could not come from a gas. But a large number — about one-third of those examined — gave "line" spectra, and these, in accordance with Rule III. of the "key," were pronounced to be true nebulæ, their faint light being undoubtedly due to glowing gases, mostly hydrogen and nitrogen. It may be added that further researches with the spectroscope, particularly those of Mr. J. N. Lockyer, have led to a new view of the nature of these mist-like objects.

According to the view of Herschel and Laplace, a nebula was a mass of intensely heated gases, containing in this form the material of future worlds. The new view is that it is an immense cloud of meteorites, which are in motion among themselves, and which, by their frequent collisions with one another, produce heat and light. In the present sparse condition of the meteors, however, their movements are slow, and the collisions are not violent, so that only their more volatile portions are rendered gaseous and luminous. The nebula is therefore at a low temperature. The "material" is there, however, though invisible; and, as the nebula contracts, and the motions of the meteors become more rapid and their collisions more violent, it will become wholly gaseous. But such is not its condition now.

The star with which we started out was said to be receding from us at the rate of thirty miles a second. The ability of the spectroscope to detect motions in the stars in a direction towards or from us is not the least astonishing of its powers. The method by which this feat is accomplished is in principle exceedingly simple. The position of a line in the star's spectrum is determined by the wave-length of the ray which causes it. If, therefore, by any means the wave-length of the ray is increased, the line will be moved from its normal position towards the red end of the spectrum, where the wave-lengths are the longest. If it is lessened the contrary will happen; the line will be displaced

towards the violet end, the region of short waves. Now, if a star is receding rapidly from us, a less number of light-waves of any given ray will enter the eye in a given time, and the effect will be the same as though, while the star remained stationary, the length of each wave in the ray was increased. To illustrate, let a person stand beside a railway track, while a freight train is passing, and let him count the cars which pass him in a minute's time. Suppose that fifty cars pass him in that time. Let the train move one half as fast, and only twenty-five cars will pass in the same time. The result is the same as though, while the train had maintained its original speed, the length of the cars had been doubled.

The amount of the displacement of the spectrum lines due to this cause, though slight, is still a measurable quantity, and one of the regular uses of the spectroscope is to determine the rate of the motions of the stars along the "line of sight. The star's approach throws its lines towards the violet end, and its recession throws them towards the red end of the spectrum.

Photographs of the spectrum of the star Mizar — the middle star in the handle of the Dipper — show a periodical doubling of the "K" line. The explanation given by Professor Pickering is that this star is double, though no telescope is able to show it double, and that its component stars or suns are revolving one about the other. The light of both stars enters the spectroscope together. When they are in certain positions in their orbits one of the stars will be approaching, while the other is receding, hence the line due to the light from one star will be displaced to the right; the other line will move to the left, and the result will be the doubling observed. This relative position will occur twice in each orbital revolution, and since the doubling occurs at intervals of fifty-two days, the period of revolution must be one hundred and four days

The variation of the star Algol, which after shining steadily for two and a half days as a star of the second magnitude descends in about four hours to the fourth magnitude and as rapidly regains its splendor, has been accounted for by supposing that it has revolving around it a dark, planetary body which

periodically passes between us and it, cutting off a portion of its light. This supposition has been confirmed by the spectroscope, which has shown that this star alternately approaches and recedes from us as it should do if it were revolving in an orbit.

This is only a meagre sketch of the work that has been done and is now doing with the spectroscope. But it should give a fairly good idea of the wide rauge of the powers of this "marvelous instrument," as it has been very justly called, and it may, perhaps, remove for many persons some of the mystery which has surrounded its astonishing performances. The key is a simple one, although it took more than forty years to discover it, reckoning from the time when Fraunhofer first mapped the principal lines of the solar spectrum.

But it must not be supposed that because the principle of the spectroscope is simple its use is not attended with difficulties. On the contrary spectroscopic observations are among the most delicate and difficult of astronomical observations. Take the case of a star. First, it must be kept steadily focussed on a slit no more than 1-300th of an inch in breadth, and which is continually altering its position with the motion of the earth. Next, its feeble light must be further weakened by being spread out into a band. Then the air is so unsteady as to cause a constant flickering and confusion of the spectrum. To detect and locate the spectral lines of a star under these circumstancces requires extraordinary keenness of vision combined with skill and patience that can hardly be overrated. Of late years photography has become a powerful ally of spectroscopy; but to go into this branch of the subject or to follow the spectroscopist in some of his more recent investigations respecting the constitution of matter and the character of those molecular changes and vibrations which reveal themselves in corresponding vibrations of the ether, would be to exceed the limits assigned to this article.

Do not expect to be real happy unless you are diligent in the Master's vineyard.

THE RELATIVE PERMANENCY OF PRINTS.

IT IS customary to regard the carbon process and similar methods of printing as giving absolutely permanent results, while the various systems based upon the employment of silver salts, but particularly in conjunction with albumen, are as comcomly set down as more or less liable to fade or change. But a brief examination of a collection of old prints will often discover anomalies in connection with the usually accepted ideas as to permanency, and raise questions as to whether some processes are so far above suspicion and others so little to be trusted as is usually supposed.

In turning over such a collection a short time back, our attention was arrested by the remark, " How evenly these prints have faded." The prints in question had the appearance of having been made upon highly surfaced or double albumenised paper, and were mostly of a warm brown tone, but the white and halftones exhibited a palpable and uniform yellowness which told an evident tale of sulphuration. Our friend was not a little astonished, and somewhat incredulous, when we assured him that the pictures were in reality photo-mechanical prints, being, in fact, specimens of collotype printing of a high quality, produced some twelve or fourteen years ago in America, and sent to us at that time in illustration of what could be accomplished in that style of printing.

Since they came into our possession they have been constantly kept in the portfolio in which they now lie, and may therefore be fairly said to have been well protected from the usual vicissitudes to which photographs are subjected. The change which has taken place, so far as we are able to judge at the present time, is solely confined to the yellowing of the lights, the image itself being apparently perfect, and, it is scarcely needful to say, can scarcely be attributed to similar causes to those that produce a like effect in albumen prints. In fact, but for one circumstance, we should have had no hesitation in setting it down to simple discoloration of the paper.

That this is not the cause, however, may, we think, be assumed from the fact, that amongst the prints are some possessing a matt surface, or at least are free from the high glaze presented by the majority, which is, of course, produced by means of a varnish applied subsequent to printing. In every case the matt prints are quite free from the discoloration shown by the others, and there can be little doubt therefore that it is to the varnish or glaze that the fault is really attributable.

The discovery of these altered collotypes caused us to make a careful examination of the rest of the contents of the portfolio, some of which are at least thirty years old, and the results were of a decidedly interesting character. For instance, amongst the pictures were a number of carbon prints by various artists and of different periods, some dating back almost as far as the publication of Swan's specification in 1864. One such print, produced as far as we can tell about 1865, presents very much the same appearance as the collotype already referred to, though the discoloration is more marked; but, in addition to that, the image itself has acquired a disagreeable greenish tone, more especially noticeable in the half-tints, and undoubtedly due to the presence of chromium compounds left in the print.

Other carbon prints of a much later date—from twelve to fifteen years old—while still remaining perfect in gradation, as well as pure in the lights, present an unpleasantly cold black tone that was certainly not their original color; whilst others, of at least the same age, still possess the warmth and freshness of tone that we can imagine to have been theirs originally. This is particularly noticeable in a couple of small prints received from abroad a dozen years back, the rich, warm brown tones being apparently as fresh as if produced yesterday.

Platinotypes are usually regarded as representing the acme of permanence, and such, no doubt, so far as the image itself is concerned, is the truth. But amongst our collection are several prints representing some of the very earliest productions in that process, and dating probably as far back as 1878. The images present, no doubt, exactly the same appearance as when the prints were newly made, but in all cases, or nearly all, the whites

are very seriously degraded; but whether from the effects of chemicals left in the prints, from natural discoloration of the paper, or from simple dirt, it is impossible to decide at a glance. The last is more than a probable cause, as from the character of the surface of the prints they are more likely to suffer from the combined effects of dust and friction than would be the case with either albumen, carbon, or other surfaced prints.

Several very early specimens of developed gelatino-bromide prints exhibit, without exception, decided signs of yellowness—in some cases of a very pronounced character—while others of a later date are entirely free from any discoloration. The change in the earlier prints can readily be traced to the want of sufficient care in the removal of the last traces of the ferrous-oxalate developer, then invariably used; while the absence of coloration in the later ones may be due partly to greater care and the use of clearing solutions, and partly, no doubt, to the employment of other developers not so liable to cause the yellow stain. In no instance is there any sign of deterioration of the image itself, or of loss of the finer details by fading or sulphuration.

The same remark applies to the earliest samples we possess of gelatino-chloride prints, although necessarily these do not date as far back as the others mentioned. Many of these are upwards of seven or eight years old, and, except for the wear and tear of handling, show no signs of deterioration. The oldest print by this process is one which the endorsement on the back tells us was sent to us in an untoned condition, as an example of what could be done with gelatino-chloride emulsion. This was, we believe, in 1883 or 1884, long before gelatino-chloride paper was an established article of commerce, and the print was toned by ourselves and put away as a curiosity.

Amongst the other curiosities is one worthy of mention, in the shape of a collodio-chloride, or highly enameled gelatino-chloride, print—we are not sure which—that was sent to us by Dr. Liesegang, some eight or nine years ago, to illustrate the fixing power of common salt. The print, after toning in the usual way, was fixed in a saturated solution of common salt, and at the present day is as fresh and bright as when received. In

this case, if any change had occurred, we should naturally not expect it to take the form of sulphuration, but rather of general discoloration from the presence of silver salts remaining from imperfect fixation; but there is not the slightest symptom of any such change.

Lastly, strange as it may appear, some of the best preserved of the old pictures in this collection are upon the much-maligned albumenised paper. A print of Mr. Francis Bedford's well-known *Brook at Kenilworth*, that must be nearly, if not quite, thirty years old, is only slightly yellowed, and that is more from dirt and age than from actual fading. Another print, of almost the same age, by Mudd, of Manchester, is absolutely as fresh and bright as if printed yesterday, and many others are nearly as well preserved. It is worthy of note, in connection with albumen prints, that those upon rough or Saxe paper appear to have kept the best, probably from some difference in the sizing.

A plain paper print, of the details of the production of which we have no particulars, though it is over thirty years old, is apparently as good as when newly made, proving again that silver prints are not necessarily evanescent.

In conclusion, we may remark that, in estimating the probable permanency of any process, it seems that at least as much attention should be paid to the care devoted to the manipulations and to other usually neglected details as to the actual constitution of the image itself.—*British Journal of Photography.*

How can you find out whether a postage stamp has been used or not? Photograph it. If the postmark has been obliterated the blue or green color will not make any impression on the plate, while the black traces of the obliteration will appear with great clearness. Even when the stamps have been well washed and no trace of the obliteration can be seen by the naked eye or through the microscope, the photograph will show very clearly the two concentric circles of the stamp, the date, and even the name of the locality.—*Popular Science News.*

CARD MOUNTS.

C. H. MILLER.

THE most important point to consider in the finishing of a photograph is the card mount, and why photographers, and especially amateurs, will mount their pictures on cards having hardly any margin, making them both inartistic and ugly, I cannot see the reason, when with a little more margin and brains they would begin to see that their pictures would be very much improved.

Take, for instance, two prints from the same negative, mount one on a say (for an 8x10) 16x20 card, and you will see that they have all the difference in the world if the right kind of card is used. I always prefer to mount my 8x10 prints on 16x20 cards, being very thin the same as plate paper, with plate mark or plain India tint in centre. I never use the large heavy cards, as it makes the picture appear all card, and most of the cards sold for platinotypes are too thick. I would advise the amateur to make his own cards, or have them made, which can be done with very little expense. For platinotype prints all he requires is to procure pure white plate paper of the required size, and after mounting the prints take them to some card manufacturer and have them make the plate mark. Another way is to procure tea cards and a roll of transferotype paper such as is used for carbon printing. Now for an 8x10 print cut out a piece of 10x12 transferotype paper and paste in centre of card, mount print on this, which will give a margin of a little over two inches around print, and makes a very neat mount for silver prints. The photographer with a little practice will be able to judge what sized tint he will require for the print he desires to mount.

For all practicable purposes I prefer the large thin white cards with plate work or India tint centre, such as engravings are mounted on; most any print looks well on these. I also very often take a very large mat and mount print on a card with about 2 inches margin, and then paste on back of mat. Use plenty of margin on your prints and you will be surprised to note the difference in the result.

CHEMICAL NOTATION AND NOMENCLATURE FOR PHOTOGRAPHIC WORKERS.

(*Continued from page 377.*)

AS an illustration of the nomenclature of compounds of two elements, when these unite in several proportions, we may refer in the first place to the compounds of nitrogen and oxygen, as there are five of these; and putting aside a possible objection that the second on the list should rather be regarded as NO than as N_2O_2, the formulæ of these compounds are as follows:

	Gravimetric Composition in parts.	
N_2O	28	16
N_2O_2	28	32
N_2O_3	28	48
N_2O_4	28	64
N_2O_5	28	80

It will be seen that while the nitrogen in the formulæ is constant, the amount of oxygen progresses in regular steps, a good illustration of what is often called the law of combination in multiple proportions, and easily comprehensible on the assumption that the atoms of nitrogen and oxygen have, in the matter of weight, some relation to each other, which can most simply be expressed by the relation seven to four, or simple multiples of these numbers, and that the atoms combine symmetrically. To enter into the reasons why fourteen and not seven is assumed to be the atomic weight of nitrogen in relation to hydrogen as one, and why sixteen and not eight or four is taken as the atomic weight of oxygen, would cause a digression hardly worth making; but we may mention that twenty years ago the symbol O commonly stood for eight, and not sixteen as now, in which case the above series of formulæ was written all through with N instead of N_2.

We must not forget that in naming such a series the termination *ide* (characteristic of a binary compound) persists all through, whatever particles indicating number, degree, or relation may be added. The method of naming a series such as the above, which is the least unsatisfactory, is that in which prefixes directly indicating numbers are used.

Thus—N_2 being regarded as the constant quantity running through the series—we may name the compounds as follows:

N_2O - -	Nitrogen ***mon***-oxide (*μόνος*, single).
	or ***prot***-oxide (*πρῶτος*, first).
N_2O_2 - -	Nitrogen ***di***-oxide (*δις*, double).
	or ***deut***-oxide (*δευτερος*, second).
	or ***bin***-oxide (*δις*, twice).
N_2O_3 - -	Nitrogen ***tri***-oxide (*τρις*, thrice).
	or ***ter***-oxide (***tertius***, the third).
N_2O_4 - -	Nitrogen ***tetr***-oxide (*τεσσαρες*, four).
N_2O_5 - -	Nitrogen ***pent***-oxide (*πεντε*, five).

In the composition of chemical names, Greek or Latin prefixes are used almost indiscriminately, although occasionally a writer will endeavor to confine himself to one language, but mostly without very pronounced success.

It very often happens that the prefix *proto* is a little indefinite, owing to its over-hasty application. Thus, the red oxide of mercury, HgO, has been called protoxide of mercury; but, another oxide, Hg_2O, having been discovered, the latter has been called sub-oxide (*sub*, under). Other prefixes are used to interpolate newly-discovered compounds, or to make good defects in earlier classification; but it will be convenient to deal with these when the nomenclature of the oxy-acids is touched upon.

The use of the prefix *per* (Latin, *per*, through), as signifying the last of a series, is very common, but, like other prefixes indicating a limit, it is often misapplied. Thus, for example, MnO_2 is often spoken of as peroxide of manganese, although higher oxides are now known to exist.

Proto and *per* are very conveniently used as antithetic terms when two compounds exist, or are in common use. Thus, $FeCl_2$ may be very conveniently spoken of as proto-chloride of iron, and Fe_2Cl_6 as perchloride of iron; but in such cases it is now a much more common usage to use the affixes *-ous* and *-ic* to signify the first and last,—or, at any rate, the first and last of the pair which is most common and important. As applied to binary compounds the use of the affixes *-ous* and *-ic* has much extended of late years, and we may give a few examples. Thus,

we have platin*ous* chloride, PCl_2 (otherwise platinum dichloride), and platin*ic* chloride, PCl_4 (otherwise platinum tetrachloride). Again, we have mercur*ous* chloride, HgCl, and mercur*ic* chloride, $HgCl_2$; also the problematical argentous chloride, Ag_2Cl, and argentic chloride, AgCl.

The custom of giving special, or popular, or unsystematic names, is almost universal in some cases. For example, few writers, other than humorists like Dr. Burton Coxe, would speak of water, alcohol, ether, by any of the various systematic names possible.

The use of terminations *-ic* and *-ous*, which we have indicated is of by no means universal application, although of general application. For example, calcium and barium form two well-defined oxides, MO and MO_2 (M standing for either of these metals), and yet the lower oxide invariably takes the termination *-ic;* CaO_1 lime or calcic oxide; BaO, baryta, or baric oxide; the higher oxide in each case being spoken of as a peroxide or binoxide. Such usages are embarrassing to the beginner, but do not act as a stumbling-block to the advanced chemical student, who sees that in these cases the termination *-ic* may reasonably be given to the normal or saturated oxide, especially as the possibility of a lower oxide being discovered suggests itself.

The term sesqui-oxide or sesqui-chloride is occasionally used, and has a reference to a time when it was not uncommon to write such formulæ as $FeO_{1½}$ or $FeCl_{1½}$ (Latin *sesqui*, one and a-half).

We have made several references to the termination *ide* being used as a characteristic of binary compounds—that is to say, compounds of two elements—and possibly some of our readers may have felt a little embarrassed in the knowledge that highly complex substances commonly receive names ending in *ide;* for example, the salt commonly known as potassium ferricyanide, and used by photographers as one constituent of a bath for reducing the density of negatives, has a composition represented by the formula $K_3FeC_6N_6$. Such cases—and they are very numerous—arise from the fact that chemists find that certain groups of elements behave as if they were elements, these groups being sometimes called *quasi*-elements, or, more commonly, compound radicles. Indeed, it may fairly be assumed that without

the view as to the existence of the compound radicle, modern theoretical chemistry, as we understand it, would hardly exist; and without some such view as a guide to investigation, it is difficult to suppose that the greater part of the complex carbon compounds known, would ever have been discovered—the extensive series of artificial coloring matters, for instance.

The first substance to be distinctly recognized as a compound radicle, or as a group acting like an element, was the gas cyanogen, a compound of carbon and nitrogen. Gay-Lussac obtained this gas in 1815, and recognized its close analogy with chlorine. Let us then take cyanogen as a typical compound radicle, and set out some of its compounds in parallel with those of chlorine. The composition of cyanogen is CN, but it is often represented by the symbol Cy, just as if it were actually an element. Hydrochloric acid, HCl (chloride of hydrogen), has its analogue in hydrocyanic acid, HCy or HCN, cyanide of hydrogen; while chloride of potassium, KCl, is represented in the cyanogen series by KCy (or KCN), potassium cyanide. Again, silver chloride, AgCl, and silver cyanide, AgCy, are very strictly analogous in their reactions and characteristics.

The analogy may be pursued somewhat further, as not only cyanide of potassium, but also chloride of potassium, can exist in a similarly oxidized state, one compound being KCyO, potassium cyanate, and the other, KClO. This latter compound would be called by a corresponding name, "potassium chlorate," if it were the only compound containing potassium chlorine and oxygen; but as it is one of four (KClO, $KClO_2$, $KClO_3$, and $KClO_4$) it has—in accordance with usages to be considered further on—to be distinguished by the name potassium hypochlorite, the term *chlorate* being reserved for another of the series.

Corresponding with the potassium cyanate, KCyO, we may have ammonium cyanate, in which the metal potassium is replaced by the compound radicle, NH_4, or ammonium, which acts like a metal, and is believed to exist in the ammonium salts, this group being often represented by the short form Am. Thus, KCyO will be potassium cyanate, AmCyO will be ammonium cyanate, and the metal being replaced by hydrogen we shall have

HCyO, or cyanic acid. The oxygen in these, as in many analogous compounds, may be replaced by sulphur, giving compounds which may be called, respectively, potassium sulphocyanate (or thiocyanate), KCyS, ammonium sulphocyanate, AmCyS, and sulphocyanic acid, HCyS. At this stage we may once more import the compound radicle, and consider the group CyS, or CNS, as a *quasi*-element, sulphocyanogen; in which case the names of the salts become potassium sulphocyanide and ammonium sulphocyanide respectively. Here we have one of the numerous instances in which a substance may receive two different names according to the view that is taken of its constitution.

The list of all the compound radicles which enter into—or are believed to enter into—the composition of materials which the photographer uses would be a longer one than it is worth while to give here; but we may indicate a few. It must be remembered that some of these radicles are not known to exist in the free state; and, when in the free state, these radicles, like the elements, are mostly assumed to be united with themselves. Thus, free hydrogen is assumed to be H_2, or hydride of hydrogen, and free cyanogen is assumed to be Cy_2, or cyanide of cyanogen. In the following partial list we give the single form of each radicle, so that this list of compound radicles becomes analogous or comparable with our table of elements on page 26.

EXAMPLES OF SUBSTANCES COMMONLY REGARDED AS COMPOUND RADICLES.

Name.	Formula.	Characteristic Compound.
Acetyl	C_2H_3O	C_2H_3O HO
Ammonium	NH_4	NH_4Cl
Cyanogen	CN	KCN
Ethyl	C_2H_5	C_2H_5 HO
Ferricyanogen	FeC_6N_6	K_3 FeC_6N_6
Ferrocyanogen	FeC_6N_6	K_4 FeC_6N_6
Hydroxyl	HO	H HO
Methyl	CH_3	CH_3 HO
Phenyl	C_6H_5	C_6H_5 HO
Sulphocyanogen	CNS	CNS K

(*To be continued.*)

SOCIETY REPORTS.

OUR attention has been called to the following announcement in the privately published proceedings of the Photographic Society of Philadelphia, with the intimation that the request came from the editor of this journal.

Now we have not the faintest idea which of our enterprising contemporaries attempted to steal the march on the rest of us. But there is one thing certain, that the request did not emanate from the staff of the AMERICAN JOURNAL OF PHOTOGRAPHY. The announcement is as follows: viz:—

"The Secretary received not long ago a polite request from the editor of one of the American photographic periodicals, that reports of the proceedings of the Society be sent to him each month for publication. This letter, and one or two other incidents which have been brought to the notice of the Publication Committee, indicate that the purpose and aim of the publication is not clearly understood. The primary motive which prompted the Society to undertake the publication was to send out a report of our *proceedings to all the photographic journals simultaneously and impartially*. The second object was to communicate to the members further details of the work of the Society than any general photographic magazine could be expected to find room for. The publication of the *Photographic Society of Philadelphia has not, and is not intended to have, a circulation beyond the membership of the Society*, the editors of the photographic press, and the principal photographic reading rooms.

So far as the AMERICAN JOURNAL OF PHOTOGRAPHY is concerned we will state that since these reports have been published by the Society we have thus far never received them in a single instance in time for publication during the current month of issue.

Further we regret to say that since the home Society has followed in the footsteps of several London societies and published their own proceedings exclusively for the members, the experience of the Society has been similar to that of all other

photographic societies which have tried the same experiment. The result has always been the same—a lack of interesting papers read before the Society,—and a marked falling off in the general interest, and but little mention of the particular society by the press at large.

Now as to the "communication to the members of further details of the work of the Society than any general photographic magazine could be expected to find room for."

The photographic press is always ready to publish any matter of news or intrinsic value that is brought out; in fact that is the aim and duty of the press.

The average society reports as formulated by the hon. secretaries are by no means a desirable item for any photographic periodical. It is the aim and object of every well-conducted periodical to publish all matters of news and general interest to its readers, no matter from what source they emanate. This is a salient fact overlooked by many of the secretaries.

Now what possible interest is it to any one whether Prof. Gobler has accidentally discovered that if he takes one quarter grain less amidol to twenty oz. developer, that his plates fix in two minutes less time than if his original formula were used. Or that in the opinion of Dr. Oxalate Strong, a blue head match had better be used to ignite aluminum flash powder, for fear that the chlorate of potash contained in the head of a parlor match might excite an electrical action which would deprive the light of one and a-half per cent. of its actinic power.

And this to the exclusion of matters of intrinsic value brought forth by members of lesser note or importance.

Let the secretary of any society look over the files of the leading photographic journals, and see how the society reports are boiled down. Then let him profit by the lesson before him.

Some society members flatter themselves that no photographic periodical can exist without their support, and unless the policy of that periodical is as they chose to dictate it cannot prosper. Now there is no greater fallacy. If photographic journalism depended upon the support received from the various societies,

it would be a thing of the past before three months would roll around.

It has always been a matter of mutual advantage, for the photographic press and the various societies to work together; their interests are identical, the aim of both being, or should be, the advancement of the art science.

The different societies, both large and small, have always received consideration and courtesy from the photographic press at large; unfortunately, however, as a rule the reverse has not been the case; few, if any societies give the various periodicals published in their interest the support due them, or that they deserve.

The members of such Societies who clamor for privately printed proceedings should remember that the power and influence of any of the regular established photographic periodicals is much greater and far-reaching than any individual sheet issued by a Society, which in many cases is but little known outside of its own circumscribed community.

J. F. SACHSE.

Measure vs. Weight of Anthracite Coal. Small egg, such as that ordinarily used for house furnaces, weighs 53 13-16 pounds per cubic foot, and a ton of it will measure 37 cubic feet. Hence a bin 4 feet square having a depth of 27¾ inches will hold a ton—or, to be exact, 1998 lbs. This of course means "strike" measure,—that is to say, the bottom of the bin must be evenly flat and the coal on top must be level with the top boards of the bin. The proportions of a bin to hold 8, 10 or 12 tons or more may be easily calculated from the foregoing; all that is necessary to ensure absolute accuracy is to be exact in the construction of the bin—this of course is essential. The figures given above are *inside* measurements. A domestic consumer having doubts as to the correctness of his coal dealer's weights, may confidently challenge them if the bin is constructed in conformity with the foregoing measurements.

A smile will accomplish more in a minute than harsh words will in a month.

PHOTOGRAPHIC PERIODICALS.

Translated from the Japanese.

THE growth of photography becomes greater day by day and its progress is wonderful; thus in the case of books on the subject of photography of ten years ago which the interest is chiefly one of curiosity. At the present time the yearly number of publications about photography is almost beyond count, whilst at the same time the number of photographic periodicals is exceedingly great; but this is because there is a real demand for these periodicals and a sufficient field for them within the boundaries of the photographic art. The following is a list of those which are in exchange with our *Shasin Sowa*; some of them are edited to suit those who have high theoretical attainments, others principally for the practical photographer. All of those periodicals are somewhat different one from another in their mode of editing and in the matter of contents, yet in all cases its aim is devoted to the success and advancement of the art of photography. The following is one of the best known and interesting periodicals which is in exchange with our Sowa. We write the name, price, etc., of these periodicals for the sake of those who may want to subscribe for it.

In the matter of the AMERICAN JOURNAL OF PHOTOGRAPHY, the writer is willing to undertake the business of subscribing for any who may wish to do so, and of sending money order, etc.

THE AMERICAN JOURNAL OF PHOTOGRAPHY (アメリカン、ジャーナル、オブ、フォトグラフィー) 毎月一回発行ノ定価一部米貨ニ十五仙ノ一ヶ年分二弗〇発行所ハ米国フィラデルフィア市アーチ街十三〇二十番地ニアリ本誌ハ毎号美麗ナル挿絵数葉ノ外ニ写真術上有益ナル事項ニ関スルモノヲ記載シタル高価ノ雑誌ナリ

Photographic Hints and Formulæ.

Photographic Formulæ.—Collected from various source and approved by the Vienna Camera Club. Developer for bromide paper (sepia tones.)

A	Water	1000 cm.³
	Oxalate of potash	330 grains
B	Water	1000 cm.³
	Chloride of potassium	130 grains
C	Water	500 cm.³
	Ferrous sulphate	24 grains
	Citric acid	2 grains
	Bromide of potassium	2 grains

for use, A, 20 parts, B, 5 parts, C, 5 parts. The intensity of the brown tone is increased in proportion of the solution B.

An Aqueous Negative Varnish.—

Water	1000 cm.
White shellac	80 grains
Borax	20 grains

Boil until the shellac is thoroughly dissolved. Place the well-washed negative before drying, in this solution for one or two minutes, then dry. The varnish at the same time acts as a retouching medium. This varnish when thinned down with water, answers well for varnishing paper prints. It is especially valuable with platinotypes where the image has sunk in the paper.

Metol Hydrochinon Developer.—Single solution developer.

Water	1000 cm.
Metol	10 grains
Sulphite of soda	29 grains
Hydrochinone	12 grains
Carb. potash	58 grains

Dissolve in order given and for use dilute 1 part solution with 3 of water.

Two-Solution Developer.—

A	Water	250 cm.
	Metol	2.5 grains
	Sulphate soda	7 grains
	Hydrochinone	3 grains
B	Water	750 cm.
	Carb. potash	15 grains

for use, mix one part A with 3 parts B for ordinary exposures,—for over-exposures use less B or add a few drops of 10 per cent. solution bromide of potassium.

Ebony Stains for Wood.—

Water	1000 cm.
Extract Campeche wood	15 grains
Chromate of potash	2 grains

for use, the extract of Campeche wood is dissolved in boiling water, and the chromate then added. The color of the solution is a deep violet, which changes into a pure black when applied to wood.

A French Stain.—

A	Water	1000 cm.
	Extract Campeche wood	50 grains
	Sulphate of iron	12 grains
B	Vinegar	1000 cm.
	Iron filings	100 grains

dissolve the extract of Campeche in boiling water, and add the sulphate of iron. Coat the wood with this solution, and when dry dampen with solution B.

A Simple Combined Toning and Fixing Bath for papers of the aristotype class.

A	Water	1000 cm.
	Nitrate of lead	10 grains
	Hypo	200 grains
B	Water	100 cm.
	Chloride of gold	1 grain

for use, add to solution A 50 cm. of solution B. The bath is now ready for use. It is however advisable to fix a few spoiled prints in the bath first. An addition of 3 per cent. boracic acid hastens the toning process, and gives fine purple tones.

A High Gloss Lubricator for Albumen and Gelatine Prints.—

White wax	100 grains
Rectified oil of turpentine	100 grains
Damara varnish	4 grains

for use, melt the wax and add the turpentine and Damara under constant stirring. When the mixture is too hard, add more turpentine.

A Gelatine Substratum for Carbon Positives.—

Water	100 cm.
Gelatine	4.5 grains

The gelatine is first soaked in water, and then dissolved by heat. A solution of bi-chromate of potash in water is then added until the liquid assumes a golden yellow color (the usual sensitizing solution will answer if not exhausted. The well-cleaned glass plates are now coated by pouring the gelatine on the centre and draining the surplus to all four corners. The plates are then dried in the dark, care being taken to keep them free from dust. Before use the plates should be exposed for two minutes to daylight.

A Uranium Toning Bath for Gelatine Papers.—

A	Water	100 cm.
	Nitrate of Uranium	1 grain
B	Water	100 cm.
	Red prussiate of potash	1 grain
C	Acetic acid	

For use, take A 50 cm., C 10 cm., B 50 cm. The well-washed print is to be left in the bath until it is a trifle redder in tone than desired. Then wash for twenty minutes in continual changes of water. When the washing is continued too long the red tone gradually disappears. The prints must not be developed too strong. This toning bath also acts as an excellent and simple intensifier for negatives, as the reddish brown tone has excellent covering properties. If the intensification is carried too far, the negative can easily be reduced by washing in water.

Rapid Hydrochinone Developer.—

A	Water	1000 cm.
	Sulphite of soda	80 grains
	Yellow prussiate of potash	30 grains
	Hydrochinone	10–12 grains
	Bromide of potassium (1–10)	10–12 cm.
	Glycerine	40 cm.
B	Water	100 cm.
	Caustic potash	50 grains

for use, dissolve in above order, and for normal exposures take 60 cm. A, to which add gradually drop by drop about 6 cm. B.

To Focus Enlargements with the "Working Stop."— Take an ordinary dry plate, fix in hypo, wash and dry well, then with an ordinary draftsman's pen charged with India ink, rule on it horizontal lines as fine and black as possible about ⅛ inch apart. This makes a focusing plate. For use, set up your enlarging apparatus and insert negative in its place. Having got the screen in position, according to size of enlargement required, take your negative out of

its carrier and in its place insert the "focussing plate," when you will find that the fine black lines can be focused with ease on the white screen. This done replace the negative and expose, and you will find the enlargement is as sharp as you can get it.

Matt-lack.—

Ether	100 cm.
Gum sandarak	10 grains
Benzol	65 cm.
Absolute alcohol	1–2 cm.

To make above cover still better add aurantia or asphalt, viz.:

Matt-lack	100 cm.
Aurentia	1 grain

or,

Matt-lack	100 cm.
Asphalt pulverized	5 grains

The two latter solutions will have to be frequently shaken and then left to settle for several days, when they can be decanted. By adding a little of either liquid to the stock solution any shade or strength of covering power can be obtained. The asphalt especially furnishes a very dense coating.

Bright Prints.—To obtain the best results on the various gelatine and Aristo papers — absolute cleanliness is a paramount necessity. To clean the measures and dishes, water alone is not sufficient for the purpose. They should occasionally be cleaned with dilute muriatic or nitric acid.

RECENT PATENTS.

THE following list of patents relating to the photographic interests is specially reported by Franklin H. Hough, Solicitor of American and Foreign Patents, No. 925 F. St., Washington, D. C.:

512, 606.—Camera. H. B. Carlton, Rochester, N. Y.

512, 512.—Panoramic roll holder camera. P. S. Marcellus, Philadelphia, Pa.

412, 914.—Photographic plate holder. C. C. Spalsbury, East Orange, New Jersey.

513, 149.—Photographer's bath and Printing Frame, Combined. F. Sandeman, London, England.

Society Notes.

The Photographic Society of Philadelphia.—At the stated meeting held Wednesday evening, March 14th, 1894, an election was held for ten members of the Committee on Science and Art for 1894-5. Nominations were also made for Officers and Directors for 1894-5. Mr. S. Ashton Hand read a paper on "Hot-Pressed Steel Cylinders for holding gases under high pressure. Are they safe?" The discussion of the report of the Committee on Standard Sensitometer was continued. A special Exhibition of lantern slides, by Dr. Benjamin Sharp, illustrating his recent trip to the Hawaiian Islands was shown Wednesday evening, March 21st. Wednesday evening, March 28th, was members' night. An explanation of the proper manner to adjust the light, lenses, etc., of the enlarging apparatus, was given. The lantern was also ready for use for testing slides brought by members. Wednesday evening, April 4th, Visitors' night, American Interchange Slides from Buffalo and Newark will be shown.

The Practical Photographer is now under new editorship, and the April issue will have a permanent increase in the number of pages, and also in the number of illustrations. The price will be increased to twopence monthly. A large number of prizes are being offered for designs, etc., of which particulars are given in accompanying circulars.

California Camera Club.—A club talk was held on Wednesday evening, March 14th, 1894, when a set of slides received from the St. Louis Camera Club and the New York Society of Amateur Photographers were shown.

The Photographic Society of Japan.—A regular meeting of the above-mentioned society was held at the rooms of the Geographical Society (Chigaku-Kyokai), Nishikonya-cho, Kyobashi-ku, Tokyo, on Friday, 9th Feb., at 5 p.m., Mr. W. K. Burton in the chair.

Mr. K. Ogura showed plain collodion that he had prepared himself, the supply both of plain collodion and of pyroxaline in the country having fallen short. He had also analyzed some of the "tabloids" that had been distributed at a recent meeting. He found that the "Pyro." tabloids consisted of pyrogallic acid, sulphite of soda, and gum Arabic. The "Accelerator" contained potassium carbonate, potassium bromide and gum Arabic. The same gentleman showed prints on albumenized paper that had been only partially printed. They had

then been cut in two, and in each case one-half had been toned and fixed in the usual way, the other half had been developed by a weak hydrokinone developer, and had been toned and fixed in a special bath. The halves of the prints treated in the ordinary way were mere ghosts, the other halves were admirable in every way. They showed pure whites, an unusually full gradation, deep shadows, and were of a fine brown tone. It was considered that the process would be a most useful one for printing in dull weather.

A Premium Offer.—In order to promote interest in the coming St. Louis Convention of the Photographers' Association of America, the G. Cramer Dry Plate Works offer as prizes a solid silver cup and fifty gold badges, handsome in design and suitably inscribed. Circulars giving full particulars and conditions may be obtained by writing to office of AMERICAN JOURNAL OF PHOTOGRAPHY.

Minneapolis Camera Club.—In order that the Board of Directors in making improvements and changes in the club rooms and in the kind of instruction and entertainment furnished at the meetings, may act in accordance with the desire of the members, they are requested to fill out a series of blanks and forward them to the secretary.

Divisions Of Time.—There are two kinds of time.—*Clock* or *mean-time*, and *apparent* or *sun time*. *Clock*-time is always *right*, while *sun*-time *varies* every day; the sun very seldom being on the meridian at *twelve o'clock*, *solar day* differing in length, owing to the elliptic. ity of the earth's orbit, etc.; but a mean solar day, as recorded by clock time, is twenty-four hours long. An *Astronomical day* begins at noon, and is counted from the first to the twenty-fourth hour. A *civil day* commences at midnight, and is counted from the first to the twelfth hour. A *Nautical day* is counted as a Civil day, but commences, like an Astronomical day, at noon. A *Calendar month* varies from 28 to 31 days. A mean *Lunar month* is 29 days, 12 hours, 44 minutes, 2 seconds and a small fraction. A *Solar year*, or the transition from one vernal equinox to another, consists of 365.24244 solar days, or 365 days, 5 hours, 48 minutes, and 49.536 seconds. A *Julian year* is 365 days; a *Gregorian year* is 365.2425 days. Every fourth year or leap year has 366 days.

Wherever the devil's roads come in sight of God's country they are paved with asphalt.

Photographic Scissors and Paste.

At the Camera Club last evening, Sir George Prescott in the Chair, a paper on "Composite Heliochromy by Three-color Printing," was read by Mr. F. E. Ives, whose remarkable process was illustrated by some beautiful color pictures on the screen. Two years ago Mr. Ives' earlier labors were made known by his lectures at the Royal Institution and the Society of Arts, and his subsequent researches have added greatly to the perfection of the results and to the likelihood of their introduction into the realms of practical printing. The photographs are taken in three colors, red, green, and blue-violet, on sensitive plates prepared with particular dyes. Placed separately in the lantern, each produces its particular monochrome, but superposed in optical contact, that is, cemented together, the various colors of the picture, with all their delicate gradations, are produced. Amongst the subjects shown were a group of grapes and apples, an artist's study of a girl's head with white and colored drapery, an ordinary black and white photograph portrait on three strips of cloth, red, white, and blue, and a Swiss mountain scene, all singularly well rendered and beautiful. The process is a particularly interesting instance of scientific advance realized by careful and accurate applications of the color principles of sight, and the lecturer was, in the discussion, highly applauded for his perseverance in his investigations and for their utility. —*London Daily Standard*, March 9th, 1894.

(At the conclusion of the reading of the paper, Captain Abney took the Chair, and in summing up the discussion, expressed his admiration of the results shown, and characterized Mr. Ives' method as a splendid application of theoretical science to the production of practical results. He said there could be no doubt as to the correctness of the principle of color selection advocated and demostrated).

Perhaps the nearest approach yet made to photography in color—heliochromy, as it is now called—is that of Mr. F. E. Ives, the American photographer, who has succeeded, by an absorption process, in blending or superposing three plates in such a manner as wonderfully to reproduce natural effects. Last night Mr. Ives showed the Camera Club some pictures of fruit and oil paintings and of scenes taken in the Yellowstone Park and the Alps, which seemed to be very faithful reproductions of the originals. The subject of the accompanying address was "Three-color Printing," the suggestion being that by an

extension of the same principle a great advance may be effected in art illustration. Captain Abney, who presided, Mr. Warnerke, Mr. Swan, Mr. Lambert, Mr. Geddes, Mr. Bale, Mr. Pennell, and others, joined in the discussion which followed the reading of the paper, and which elicited a large diversity of opinion as to the sufficiency of the three-color principle, and even as to the desirability of color photography, side by side with a general tribute to the excellence of the results that had been shown on the screen.—*Telegraph.*

Spotty Prints.—For many years past we have noticed and called attention to the fact, that at this season, complaints of minute spots on silver prints are more prevalent than at any other time. We are not alluding to spots that make their appearance months after the prints have been mounted, but to those small ones that are frequently met with before they are mounted, or within a very short time afterwards. This year is no exception, and we have already seen several examples that have greatly perplexed those who have produced the prints, and who, in the generality of cases have attributed the evil to anything but the right cause, namely, dust. It often happens that at the time the prints are taken out of the washing water sweeping and dusting operations are going on. Now, the dust of photographic work-rooms is of a very pernicious character, consisting as it does of particles of hypo, pyro, and numerous other equally deleterious matters, rendered by the artificial heating of the apartment. It will at once be admitted that, if any such particles settled on a moist print, they would cause trouble. Apart from the floating particles employed, there are often others present that are equally as deleterious, the dust from coke stoves, for example. When the fire is poked, or the ashes are raked out, a dust of a sulphurous nature is created, which, if any particles settle on a wet print, is almost certain to produce spots. On one occasion, we placed some moist prints on a coke stove, and then stirred the fire so as to raise a dust, which was then allowed to settle. The result was that after a day or two the prints showed as prolific a crop of minute spots as could well be imagined.—*The British Journal of Photography.*

Mr. S. W. Burnham has been, by the Board of Trustees, unanimously elected Professor of Practical Astronomy in the University of Chicago. It is an appointment on which both the trustees and the professors are to be congratulated. Astronomers everywhere will now know that the great Yerkes 40-inch refractor will be turned to good account.

He who loves music, poetry and art, is not one man, but three.

In the Twilight Hour.

THE worst mendicant is he who has the largest unused power for doing good.

A FORTUNE can be squandered a dollar at a time, and a life wasted an hour at a time.

SOME of the poorest people you ever saw were very rich people; rich in purse, beggars in soul and heart.

THE rose shows little beauty until it unfolds its petals from over its heart and lifts its head upward toward the sun.

THERE is use for the man of God who to-day will have the divine courage to call the popular sins of the times by their right names.

THERE are many persons who do not know how to idle their time alone; they are the scourge of those who are occupied. —*De Bonald.*

LET no knowledge satisfy but that which lifts above the world, which weans from the world, which makes the world a footstool.—*Spurgeon.*

IT is a low plane of living for one to insist on his own pleasure without regard to its effects on others. Such a life reaps little gladness or blessing.

WHAT of it! The sun is over head, and life a glad, rich thing, even if the morning stake is over brown! It is folly to throw away the beauty and joy of a day because some trifle did not go to suit.

IF a man wants to have his motives respected he must take care that his acts are right. There is danger of mistake in attributing motives, we readily admit: but when a man's acts are consistently wrong we are not bound to hold that his motives were consistently right.—*The Independent.*

FAULT finding is a debased currency, with none of the Lord's gold in it.

MONEY will not take the place of service, nor service the place of love.

MEN will go on boards, circulate subscription papers, pass resolutions, pay money (a little), but there are exceedingly few that will quit all red tape, and come eye to eye, heart to heart, hand to hand with men and women who are out of Christ.

IF the masses could be made to believe that churches are not social clubs; that Christianity means not a dogma, or creed, or ceremony; but love to God, and love to one's neighbor, of the self-sacrificing kind, we would chain the old adversary in ninety days, and claim the world for Christ before the year 1900.

PRINTER'S INK.

If half the ink that's vainly spent,
Had figured in advertisement,
To tell the world in letters bold,
The kind of wares you bought and sold,
Or manufactured at your mill,
The advertiser's purse 'twould fill;
His credit at the bank would swell,
His bank-book large deposits tell.
More and more his trade would grow,
And buyers, too, would always know
Just where to go to fill the wants
Of children, cousins, wife and aunts.
And keep it up, day in, day out,
Never falter, never doubt,
For in the end 'tis sure to tell,
The people read, if not, they spell.
They'll find out just what you've got,
But print the truth, deceive them not!
The press will always give the news,
'While poets, writers, air their views,
'Twill also tell the world about
Just where *your* sign is hanging out.
Then take advice, you'll find it wise,
Use printer's ink and advertise.

Literary and Business Notes.

One is amused at the attention given to what we call pin-hole photography. This is a subject that the French never tire of, and it is worth noting that in the history of the invention and perfection of photography, the Americans are not mentioned. The lecturer upon this subject has evidently not been reading the AMERICAN JOURNAL OF PHOTOGRAPHY.

AMATEUR PHOTOGRAPHY: A PRACTICAL GUIDE FOR THE BEGINNER. By W. I. Lincoln Adams. Scovill & Adams Co., 423 Broome Street, New York.

A treatise for the amateur by one whose experience of and immediate contact with the wants of those who are using the camera in and out of doors, especially fit him to prepare a hand-book that will both serve as a guide to the ordinary work, and will introduce the reader to new fields of interest.

The little volume has been written exclusively for the amateur, and is what is needed by any one who intends to take up the charming pasture of photography during the coming spring.

CONFÉRENCES PUBLIQUES SUR LA PHOTOGRAPHIE. Organisées en 1891–92. Par le Directeur de l'Etablissement. Paris, Gauthier-Villars et Fils. Du Conservatoire National des Arts et Metiers. 55 Quai des Grands Augustins. 1893.

This work is comprised of a series of discourses or lectures delivered upon photography and its different branches during the winter of 1891 and 1892, beginning upon the 22d of November and delivered weekly until the 10th of the following April, to the Conservatoire National des Arts et Metiers.

The following constitutes the contents of the work:

1st. Opening remarks by Col. Saussedot, and "Invention and Applications of Photography," by M. A. Davanne.

2d. "Chronophotographie," by M. G. Demenii.

3d. "Photography in Colors," by M. G. Lippmann.

4th. "Astronomical Photography," by M. J. Janssen.

5th. "Photography Without an Objective," by Captain R. Colson.

6th. "Photographic Chemistry," by M. C. Fabre.

7th. "Celestial Photography," by M. A. Cornu.

8th. "Medical Photography," by M. A. Loude.

9th. "Military Photography and Photocartographie," by Commr. Fribourg.

10th. "Photography for Book Illustration," by M. Leon Vidal.

11th. "History of the Photographic Objective," by M. E. Wallon.

12th. "Registering of Natural Phenomenon by Photography," by M. Trutat.

13th. "Isometrical and Topographical Photography," by Col. Saussedot.

14th. "Microphotography," by M. L. Duchesne.

15th. "Panoramic Photography," by M. le Commandant Moessard.

16th. "Experiments in the Chemical Action of Light and in Heliochromie," by M. H. Becquerel.

17th. "The Processes of Photography," by M. Ch. Gravier.

18th. "Film Photography," by M. G. Balagny.

19th. "Photographic Physics," by M. A. Buguet.

The book contains over one hundred and ninety wood-cut illustrations, besides a number of plates, the latter being chiefly to illustrate the article on "Isometrical Photography." The whole forms a very complete and useful account of photography in its various applications, and one cannot help feeling that such a book in English would be exceedingly useful, putting so much information as it does all in hand at once.